

6—1 Proportions

Ratio—compares two quantities

$$a:b$$

$$\frac{a}{b} \quad (b \neq 0)$$

Example
1860 students
310 athletes

Athlete: student ratio

$$\frac{310}{1860} = \frac{1}{6}$$

Athlete: non-athlete ratio $1860 - 310 = 1550$

$$\frac{310}{1550} = \frac{1}{5}$$

Must convert to the same unit!

K H D Base D C M

200cm

2m



40cm

meter
2

L:W

$$\frac{200}{40} = \frac{5}{1}$$

Simplify

2 ft : 20 in

$$\frac{24}{20} = \frac{6}{5}$$

12 ft : 5 yd (3ft = 1yd)

$$\frac{12}{15} = \frac{4}{5}$$

The ratio of 2 supplementary angles is 4:5.
What are the measures of the angles?

$$\begin{aligned}
 4x + 5x &= 180 \\
 9x &= 180 \\
 x &= 20 \\
 80^\circ \quad 100^\circ
 \end{aligned}$$

The ratio of the angles in a triangle are 2:3:4.
What are the measures of the angles?

$$\begin{aligned}
 2x + 3x + 4x &= 180 \\
 9x &= 180 \\
 x &= 20 \\
 40^\circ \quad 60^\circ \quad 80^\circ
 \end{aligned}$$

The ratio of the sides of a triangle are 5:12:13.
The perimeter is 90 cm. What are the lengths of the sides?

$$\begin{aligned}
 5x + 12x + 13x &= 90 \\
 30x &= 90 \\
 x &= 3 \\
 \begin{array}{|l} 15\text{cm} \\ 36\text{cm} \\ 39\text{cm} \end{array}
 \end{aligned}$$

Do:

1. The ratio of the angles in a triangle are 1:5:6.
Find the angles.

2. The ratio of the angles in a triangle are 3:5:7.
Find the angles.

Proportion—equation stating 2 ratios =

$$\frac{a}{b} = \frac{c}{d}$$

Means

"a is to b as c is to d"

Extremes $ad = bc$

$\frac{a}{c} = \frac{b}{d}$

$\frac{b}{a} = \frac{d}{c}$

"a is to b as c is to d"

Product of Means = Product of the extremes

Examples

$$\frac{6}{18.2} = \frac{9}{y}$$

$$\frac{6y}{6} = \frac{9(18.2)}{6}$$

$$y = 27.3$$

$$\frac{6}{9} = \frac{18.2}{y}$$

$$\frac{2}{3} = \frac{18.2}{y}$$

$$\frac{2}{18.2} = \frac{3}{y}$$

$$\frac{1}{9.1} = \frac{3}{y}$$

$$\frac{6(4x-5)}{3} = \frac{-26}{6}$$

$$6(4x-5) = 3(-26)$$

$$x = -2$$

ex Actual
 $L = 40 \text{ ft}$ $W = 9 \text{ ft}$

Scale model
 $\frac{40}{9} = \frac{16}{x}$ $L = 16 \text{ units}$ $W = ?$
 $x = 3.6 \text{ units}$

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4. **HOCKEY** A hockey player scored 9 goals in 12 games. Find the ratio of goals to games.

$$\frac{9}{12} = \left(\frac{3}{4} \right)$$

5. **SCULPTURE** A replica of *The Thinker* is 10 inches tall. A statue of *The Thinker*, located in front of Grawemeyer Hall on the Belnap Campus of the University of Louisville in Kentucky, is 10 feet tall. What is the ratio of the replica to the statue in Louisville?



Solve each proportion.

$$\frac{1}{12}$$

$$\frac{10}{120}$$

Solve each proportion.

6. $\frac{x}{5} = \frac{11}{35}$

$$x = \frac{11}{7}$$

11. **GRID IN** The scale on a map indicates that 1.5 centimeters represent 200 miles. If the distance on the map between Norfolk, Virginia, and Atlanta, Georgia, measures 2.4 centimeters, how many miles apart are the cities?

$$\frac{1.5}{200} = \frac{2.4}{x}$$

$$x = 320 \text{ mi}$$